CLAIMS

1.   A method of evaluating a shape of a
semiconductor wafer comprising the steps of:
        measuring shape data of a semiconductor wafer
by scanning a front surface and/or a back surface
of the semiconductor wafer;
        calculating a differential profile through a
differential process of the measured shape data;
        analyzing the obtained differential profile
and obtaining a surface characteristic of the
wafer, and;
        evaluating a shape of the semiconductor wafer.

2.   The method of evaluating a shape of a
semiconductor wafer according to claim 1, wherein
the surface characteristic of the semiconductor
wafer is obtained at least in the peripheral
portion of the semiconductor wafer.

3.   The method of evaluating a shape of a
semiconductor wafer according to claim 1 or 2,
wherein the shape data of the semiconductor wafer
are measured by scanning the front surface and/or
the back surface of the semiconductor wafer at an
interval of 1 mm or less.

4. The method of evaluating a shape of a
semiconductor wafer according to any one of claims
1-3, wherein the shape data of the semiconductor
wafer are displacement data of a plane of the
semiconductor wafer and/or thickness data of the
semiconductor wafer.

5. The method of evaluating a shape of a
semiconductor wafer according to claim 4, wherein
the displacement data of the plane of the
semiconductor wafer are displacement of a plane in
a direction of thickness in the front surface or
the back surface of the wafer when the
semiconductor wafer is placed without suction.

6. The method of evaluating a shape of a
semiconductor wafer according to claim 4, wherein
the thickness data of the semiconductor wafer are
displacement of a plane in a direction of
thickness in one main surface of the wafer when an
entire of another main surface of the
semiconductor wafer is sucked.

7. The method of evaluating a shape of a
semiconductor wafer according to claim 4, wherein
the displacement data of the plane of the
semiconductor wafer are displacement of planes in

a direction of thickness in the front surface and
the back surface of the wafer when a part of the
semiconductor wafer is sucked with a wafer holder,
and the thickness data of the semiconductor wafer
are difference of the displacement data of planes
in the front surface and the back surface of the
wafer when a part of the semiconductor wafer is
sucked.

8.   The method of evaluating a shape of a
semiconductor wafer according to any one of claims
1-7, wherein the differential process of the
measured shape data is performed by, at first,
drawing a shape profile along a radial direction
from the measured shape data, and calculating a
differential profile through differentiation of
the shape profile at a constant interval with
setting an arbitrary point as a reference.

9.   The method of evaluating a shape of a
semiconductor wafer according to claim 8, wherein
a second differential profile is used as the
differential profile, which is calculated by
differentiating the shape profile at a constant
interval with setting an arbitrary point as a
reference to calculate a first differential
profile, and subsequently further differentiating

the first differential profile at a constant
interval.

10.   The method of evaluating a shape of a
semiconductor wafer according to claim 8 or 9,
wherein the shape profile is differentiated at an
interval of 1 mm.

11.   The method of evaluating a shape of a
semiconductor wafer according to claim 9 or 10,
wherein the first differential profile is
differentiated at an interval of 1 mm.

12.   The method of evaluating a shape of a
semiconductor wafer according to any one of claims
8 - 11, wherein removal of components with long
wavelengths and/or measured noise is conducted
when calculating the differential profile.

13.   The method of evaluating a shape of a
semiconductor wafer according to claim 12, wherein
the removal of components with long wavelengths is
conducted by means of least squares approximation
or high-pass filter.

14.   The method of evaluating a shape of a
semiconductor wafer according to claim 12, wherein

the removal of the measured noise is performed by means of moving average or low-pass filter.

15. The method of evaluating a shape of a semiconductor wafer according to any one of claims 1 - 14, wherein the surface characteristic of the semiconductor wafer is obtained by setting a most peripheral point of the calculated differential profile as a most peripheral data point A1, scanning the differential profile from the most peripheral data point A1 to a center of the wafer and detecting a point where zero is firstly obtained as a Roll Off starting point B1, and performing analysis with setting the Roll Off starting point B1 as a reference.

16. The method of evaluating a shape of a semiconductor wafer according to any one of claims 1 - 15, wherein the surface characteristic of the semiconductor wafer is obtained by setting a most peripheral point of the calculated differential profile as a most peripheral data point A1, scanning the differential profile from the most peripheral data point A1 to a center of the wafer and detecting a position where a maximum value is obtained as a Flip Up maximum slope position C1, and performing analysis with setting the Flip Up

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maximum slope position C1 as a reference.

17.   The method of evaluating a shape of a
semiconductor wafer according to claim 16, wherein
the surface characteristic of the semiconductor
wafer is obtained by scanning the differential
profile from the calculated Flip Up maximum slope
position C1 to a center of the wafer and detecting
a position where zero is firstly obtained as a
Flip Up starting point D1, and performing analysis
with setting the Flip Up starting point D1 as a
reference.

18.   The method of evaluating a shape of a
semiconductor wafer according to any one of claims
9 - 17, wherein the surface characteristic of the
semiconductor wafer is obtained by setting a most
peripheral point of the second differential
profile calculated as the differential profile as
a most peripheral data point A2, scanning the
second differential profile from the most
peripheral data point A2 to a center of the wafer
and detecting a position where zero is firstly
obtained as a Flip Up maximum slope position C2,
and performing analysis with setting the Flip Up
maximum slope position C2 as a reference.

19. The method of evaluating a shape of a semiconductor wafer according to any one of claims 1 - 18, wherein a threshold is set to the differential profile, and a locally abnormal value of the shape of the wafer is detected.

20. The method of evaluating a shape of a semiconductor wafer according to claim 19, wherein the threshold is set at ±0.01 μm/mm.

21. The method of evaluating a shape of a semiconductor wafer according to any one of claims 8 - 20, wherein the surface characteristic of the semiconductor wafer obtained along the radial direction is calculated all round the wafer.

22. The method of evaluating a shape of a semiconductor wafer according to claim 21, wherein the surface characteristic all round the semiconductor wafer is obtained at an interval of a central angle of the wafer of 1 ° or less.

23. An apparatus for evaluating a shape of a semiconductor wafer, comprising at least:
    a shape measuring means for measuring shape data of a semiconductor wafer;
    a memorizing means for storing the measured

shape data;

a differential processing means for differentiating the stored shape data and calculating a differential profile, and;

a surface characteristic calculating means for obtaining a surface characteristic of the wafer by analyzing the calculated differential profile.

24. The apparatus for evaluating a shape of a semiconductor wafer according to claim 23, wherein the shape measuring means is a means such that displacement data of a plane are obtained as the shape data by measuring displacement of a plane in a direction of thickness in a front surface or a back surface of the semiconductor wafer placed without suction.

25. The apparatus for evaluating a shape of a semiconductor wafer according to claim 23, wherein the shape measuring means is a means such that thickness data are obtained as the shape data by measuring displacement of a plane in a direction of thickness in one main surface of the semiconductor wafer of which an entire of another main surface is sucked.

26. The apparatus for evaluating a shape of a
semiconductor wafer according to claim 23, wherein
the shape measuring means is a means such that, as
the shape data, displacement data of a plane are
obtained by measuring displacement of planes in a
direction of thickness in a front surface and a
back surface of the semiconductor wafer of which a
part is sucked by a wafer holder, and thickness
data are obtained by measuring difference of the
obtained displacement data of the planes in the
front surface and the back surface of the wafer.

27. The apparatus for evaluating a shape of a
semiconductor wafer according to any one of claims
23 - 26, wherein the differential processing means
is a means such that a shape profile along a
radial direction is drawn from the shape data, and
the differential profile is calculated through
differentiation of the shape profile at a constant
interval with setting an arbitrary position as a
reference.

28. The apparatus for evaluating a shape of a
semiconductor wafer according to claim 27, wherein
the differential processing means is a means such
that a first differential profile is calculated
through differentiation of the shape profile at a

constant interval with setting an arbitrary position as a reference, and subsequently a second differential profile is calculated through further differentiation of the first differential profile at a constant interval.

29. The apparatus for evaluating a shape of a semiconductor wafer according to any one of claims 23 - 28, wherein the differential processing means is a means such that removal of components with long wavelengths and/or measured noise is conducted.

30. The apparatus for evaluating a shape of a semiconductor wafer according to any one of claims 23 - 29, wherein the surface characteristic calculating means is a means such that a most peripheral point of the differential profile is set as a most peripheral data point A1, the differential profile is scanned from the most peripheral data point A1 to a center of the wafer, a point where zero is firstly obtained is detected as a Roll Off starting point B1, analysis is performed with setting the Roll Off starting point B1 as a reference, and the surface characteristic of the wafer is obtained.

31. The apparatus for evaluating a shape of a semiconductor wafer according to any one of claims 23 - 30, wherein the surface characteristic calculating means is a means such that a most peripheral point of the differential profile is set as a most peripheral data point A1, the differential profile is scanned from the most peripheral data point A1 to a center of the wafer, a point where the maximum value is obtained is detected as a Flip Up maximum slope position C1, analysis is performed with setting the Flip Up maximum slope position C1 as a reference, and the surface characteristic of the wafer is obtained.

32. The apparatus for evaluating a shape of a semiconductor wafer according to claim 31, wherein the surface characteristic calculating means is a means such that the differential profile is scanned from the calculated Flip Up maximum slope position C1 to a center of the wafer, a position where zero is firstly obtained is detected as a Flip Up starting point D1, analysis is performed with setting the Flip Up starting point D1 as a reference, and the surface characteristic of the wafer is obtained.

33. The apparatus for evaluating a shape of a

semiconductor wafer according to any one of claims 28 - 32, wherein the surface characteristic calculating means is a means such that a most peripheral point of the second differential profile calculated as the differential profile is set as a most peripheral data point A2, the second differential profile is scanned from the most peripheral data point A2 to a center of the wafer, a position where zero is firstly obtained is detected as a Flip Up maximum slope position C2, analysis is performed with setting the Flip Up maximum slope position C2 as a reference, and the surface characteristic of the wafer is obtained.

34. The apparatus for evaluating a shape of a semiconductor wafer according to any one of claims 23 - 33, wherein the surface characteristic calculating means is a means such that a threshold is set to the differential profile, and a locally abnormal value of the shape of the wafer is detected.